



June 2002

PR researcher wins Air Force R&D award

by Ranney Adams, Propulsion Directorate

EDWARDS AIR FORCE BASE, Calif. — Rocket propulsion innovations are the expected result of scientific efforts made at the Air Force Research Laboratory's Edwards Research Site.

Tackling this research is routine for Capt James P. Lake of the lab's electric propulsion research group and he and his team produce results that may change future Air Force capabilities.

These efforts create opportunities and rewards. In addition to being selected for the Air Force Test Pilot School Class of 2002, Lake was recently notified by the Air Force Chief Scientist Office that he was to be one of five recipients of the Air Force Research and Development Award for 2001. The award selection team was led by Air Force Chief Scientist, Dr. Alexander H. Levis, who advises the Chief of Staff and Secretary of the Air Force on a wide range of leading-edge scientific and technical issues affecting the Air Force mission.

Lake received the honor from AFRL commander, Maj. Gen. Paul D. Nielsen, during a special awards ceremony held at the Edwards Research Site this spring.

Developing scientific research and turning it into future Air Force technology is Lake's responsibility at Edwards Air Force Base. Most recently, Lake co-invented the breakthrough technology of the world's first controllable solid propellant. Normally, once you light a solid propellant, it will continue to burn until its propellant is exhausted or something happens to the motor wall or nozzle. The latter usually spells disaster. Being able to turn the rocket on and off is both innovative and potentially valuable to the Air Force.

Solid rocket motors come in all sizes, but right now, Lake's research is limited to lab scale research on very small rocket motors like those used for hobbyists.

Because his research was devoted to satellite propulsion, he needed to examine all potential options. Currently, liquid or solid propelled satellites carry a limited amount of propellant, and when it is gone, there is no way to change or maintain a spacecraft in orbit. Being able to use small solid rockets was not a good option because once lit, they were consumed and there was no control over the length of the burn. Lake's on-off capability of small solid rocket motors may pave the way to use this type of propulsion on future spacecraft.

His inventive nature is not limited to solid rocket motor technology. He also created a wide-array of fully automated spacecraft thruster test facilities housed in the lab's vacuum chambers, that simulate operable space conditions. They are used to measure performance and life expectancy of electric propulsion thrusters. An example is the High Power Hall Thruster, which could provide next-generation Air Force satellites with innovative and efficient propulsion for extended orbital maneuvers and missions. In addition to Hall Thruster propulsion, micro-pulsed plasma thrusters that are being developed and tested using Lake's hardware and software can provide the fine control of spacecraft maneuvering. This type of propulsion might be used on future experimental Air Force satellite systems.

Lake has already received recognition for his research efforts as one of the lab officers recently featured in the August 2001 article "Rocket Renaissance" that was published in *Airman* magazine. The article describes Lake's activities developing and testing miniaturized satellite thrusters. In the article he is quoted as saying, "It's cool to think that in 10 years we'll look back and say, 'Oh yeah, we're the people who built those components with our bare hands and made sure they worked.'"

Since his arrival at the lab, he has applied his education and experience to research for the Spacecraft Propulsion Branch of the lab's Propulsion Sciences and Advanced Concepts Division. His undergraduate studies earned him a bachelor's degree in Aerospace Engineering at the Florida Institute of Technology. His master's degree in Aerospace Engineering at Georgia Institute of Technology, and his doctorate degree at the Air Force Institute of Technology.